

THE GEORGE WASHINGTON UNIVERSITY
SCHOOL OF GOVERNMENT

WASHINGTON, DISTRICT OF COLUMBIA

THE FORMULATION, REVIEW, AND
CONTROL OF THE NAVY RESEARCH
AND DEVELOPMENT PROGRAM

For
NAVY GRADUATE COMPTROLLERSHIP COURSE
Business Administration
Dr. A. Rex Johnson

Prepared by
ROBERT E. DOHERTY
CDR, U.S. NAVY
January, 1956

THE BOARD OF ADVISORS
OF THE DEPARTMENT OF THE ARMY
WASHINGTON, DISTRICT OF COLUMBIA

THE BOARD OF ADVISORS
OF THE DEPARTMENT OF THE ARMY
AND DEVELOPMENT PROGRAM

For
NAVY AND MARINE CORPS
OFFICIALS AND CIVILIANS
Dr. J. H. Johnson

Presented by
ROBERT E. JOHNSON
U.S. NAVY
January, 1960

PREFACE

Periodically one may read in a newspaper or a magazine certain articles which appear on the research and development programs being prosecuted in this country. On the one hand it is stated that the United States is lagging in this technical development; on the other we are neglecting basic research in a completely different area. Or perhaps it is hinted that new and revolutionary weapons will soon be unveiled by the Defense Department. In any case, it would appear that research and development programs are sufficiently in the public eye that their importance is realized. John Taxpayer relies on the research and development personnel to produce those weapon systems (and other components directly associated with military requirements) which will enable the U.S. to stay at least one step ahead of other nations in all phases of technical ability and knowledge. The deadly importance of these research and development programs need not be dwelt upon; neither, however, should the programs be taken for granted.

Because of the long range implications of many of our research and development programs, and the fact that it normally takes years to do the proper research then develop and produce a piece of equipment, continuous available funds for this purpose assume greater importance than in many other budget areas. A sustained and consistent year to year level of funds is therefore

almost mandatory if efficient results are to be expected. Efforts have been made in the Defense Department to maintain research and development funds at an almost constant level in the last few years; these efforts have already proven very beneficial.

In the following chapters an attempt has been made to show the basic steps involved in the formulation, review, and control of the Navy Research and Development Program. There are two distinct elements involved in considering this program, and, of necessity, both have been included. One of these elements is the research and development program as indicated by actual research and hardware projects supporting operational requirements; the other element consists of the accompanying fiscal programming required by a recently revised research and development appropriation structure.

almost exclusively if efficient results are to be obtained. Various
days have been in the balance Government to certain periods and
development/ (that is to say, the period from the last 100
years) have often been almost entirely devoted.

In the following chapters an attempt will be made to show
the part which has been played in the development, review, and control
of the various branches and departments of industry. There are two
distinct elements involved in carrying out a task, namely, the
planning, and the execution. Both are very important. One of these elements is the
planning, and development process as indicated by the title of the
and the other is the execution of the plan. The planning process
often consists of the following steps: (1) the determination of the
objectives of the project; (2) the selection of the methods and
materials to be used; (3) the determination of the time and cost
of the project; (4) the determination of the personnel to be
employed; (5) the determination of the equipment to be used; (6) the
determination of the location of the project; (7) the determination
of the method of communication; (8) the determination of the method
of record keeping; (9) the determination of the method of
reporting; (10) the determination of the method of control.

CONTENTS

	Page
PREFACE	11
Chapter	
I. ADMINISTRATION OF THE RESEARCH AND DEVELOPMENT APPROPRIATION	1
Introduction	
General basis for pricing research and development	
Administration of the appropriation	
Emergency fund for research and develop- ment	
Budget classifications for research and development	
II. FORMULATION OF THE NAVY RESEARCH AND DEVELOPMENT BUDGET.	8
Programs and budgets	
Parallel lines followed from a programming and fiscal viewpoint	
Detailed steps of formulation	
III. REVIEW OF THE RESEARCH AND DEVELOPMENT BUDGET..	14
Recent reorganization changes	
Review agencies	
IV. CONTROL OF THE NAVY RESEARCH AND DEVELOPMENT BUDGET.	20
Comptroller, Department of Defense	
Navy Comptroller for research and develop- ment	
Internal control by Bureaus	
V. PROBLEMS INVOLVED IN RESEARCH AND DEVELOPMENT AND A SUMMARY OF NAVY PROCEDURES.	24
APPENDIX I.	27
BIBLIOGRAPHY.	28

CHAPTER I

ADMINISTRATION OF THE RESEARCH AND DEVELOPMENT APPROPRIATION

Introduction.--The types and objectives of naval research and development programs were well summarized by the Assistant Secretary of the Navy for Air when he appeared before Congress in 1954.

Our plans provide for a continuation of a level program in research and development. In addition to the emphasis being placed on the developments in the area of nuclear propulsion reactors for submarines and surface ships, the Navy research and development program is directed toward development of weapons, facilities, and techniques of such a potential that the Navy mission of gaining and maintaining control of the seas will be reasonably assured. This program provides for improving fleet readiness, through development of improved detection and tracking devices, development of guided missiles, anti-aircraft control systems, high speed interceptors, and methods of controlling and coordinating air defense systems. ... The Navy is furthering its ability to live, work, and fight in cold weather. ... Newly developed high performance aircraft require improved fire control, armament, navigational, communications, and detection equipment. Likewise improved catapults, arresting gear and other carrier handling gear have made it necessary to direct efforts in research and development to these fields in order to produce equipment to match the new airplanes. Research and development in the fields of prosubmarine and anti-submarine warfare is keeping abreast of new technological advances in this area. To sum it up, our objective is to stay at least one jump ahead of any potential enemy through the development of advanced weapons, techniques, and facilities.¹

Research and development programs, like all other programs, show results directly proportional to the funds allocated, the

¹Hearings before Sub-Committee of the Committee on appropriations H.R. 84th Congress

"calculated risk" element notwithstanding. The table below shows the total of Navy programs in research and development for fiscal years 1954, 1955, and 1956:¹

<u>Navy</u>	<u>Total Department of Defense</u>
1954 - \$475.8 Million	\$1,384.8 Billion
1955 - 431.0 "	1,307.0 "
1956 - 431.9 "	1,368.9 "

General basis for pricing research and development programs.--It is appropriate, before looking into the detailed formulation and review of the navy research and development budget, to cover generally the basis on which these programs are priced and funded. For this reason, a discussion on the administration of the navy research and development appropriation is introduced at this point. There are numerous problems associated with arriving at a sound yet economical estimate for research and development programs. The following statement sums up many of these problems.

The funds requested under this appropriation are the result of an estimating process that is a mixture of the exact and of the best estimate possible. Research and development basically is an investigation into the unknown and as such does not lend itself to the exact cost estimating processes common to procurement and other hindrance appropriations. ... Consequently in establishing the budget for this program, it is first necessary to determine the military problems that require solution, the time available as limited by military necessity, and the research and development work necessary to meet the requirements. Then the projects must be priced, by means of contractor estimates in some cases, estimates of cost prepared by Navy laboratories in others, and in some by merely indicating in terms of dollars the level of effort that is reasonable within the exigencies of the military objective to be met. The total costs arrived at in this manner, then under

¹Special Analysis H, Research and Development, Bureau of the Budget.

normal conditions, must be reviewed, reworked, and reduced in cost and scope.¹

Appropriation structure.--Policies, procedures, and responsibilities for the budgeting, accounting, and reporting of the research and development appropriation are issued by the office of the Navy Comptroller. The entire naval research and development budget is now programmed under the one appropriation "Research and Development, Navy."

Under the Department of Defense Appropriation Act, 1955, funds for research and development were removed from various annual appropriations and were combined with those contained in the no-year appropriation "Research, Navy" (Office of Naval Research) to establish a new single no-year appropriation "Research and Development, Navy."

In the preparation of the fiscal year 1956 budget for submission to Congress, a uniform program structure for research and development appropriations also was instituted by the three military services. This standard budget and expense accounting classification contains eight control points on classifications which are explained in more detail in the latter part of this chapter.

For fiscal year 1956 and subsequent years the Navy research and development appropriation will contain a sub-head for the research and development program of each Bureau, the U.S. Marine Corps, and the Office of Naval Research. Thus, for the entire naval program, there will only be one no-year appropriation and

¹Naval hearings before Sub-Committee of the Committee on Appropriations, H.R. 84th Congress.

General conditions, and in addition, reviewed, and revised in general terms.

International standing, relations, and the

responsibilities for the subject, including, and reporting of the progress and development of the subject in the office of the Secretary of State. The subject is now being reviewed, and revised in general terms.

Development, etc.

From the Secretary of State, Washington, D.C., 1900.

From the Secretary of State, Washington, D.C., 1900. The subject is now being reviewed, and revised in general terms.

From the Secretary of State, Washington, D.C., 1900. The subject is now being reviewed, and revised in general terms.

From the Secretary of State, Washington, D.C., 1900. The subject is now being reviewed, and revised in general terms.

From the Secretary of State, Washington, D.C., 1900. The subject is now being reviewed, and revised in general terms.

individual agency allocations will be listed under this appropriation.

Administration of the appropriation.--The Office of Naval Research is responsible for preparing and submitting an Apportionment Schedule or a Reapportionment as appropriate. The approved apportionment schedules are provided to the naval research and development agency concerned by the Navy Comptroller (via the Chief of Naval Research). The appropriation is operated on a six year cycle for purposes of continuous evaluation of each program year by all echelons of management and for review and reconsideration of obligations and those obligations unliquidated for five years or more. It is noteworthy, under this new continuing appropriation, that funds that are not obligated in the current fiscal year may be carried over to the succeeding fiscal year by the activity concerned. Formerly, under the old appropriation structure, any unobligated funds at the close of the fiscal year reverted to the Treasury. The new no-year appropriation is of great assistance in providing a stable yet flexible program.

Justification of the appropriation.--The new single appropriation for naval research and development simplifies the basic justification for the program before Congress in that the justification now encompasses the entire program rather than presentation by portions. However, this also poses certain problems in that it more or less requires one spokesman for naval research and development. Formerly individual bureaus concerned justified their own portion of the program. From the viewpoint of the performance budget the over-all look is helpful to the Congress; from

the viewpoint of the agencies concerned it probably does not assist individual justification since no one individual could be expected to fully know all the details and ramifications of this program.

Emergency fund for research and development (Department of Defense) --In recent years there has been a provision in the appropriation law for the Office of the Secretary of Defense that assigns a certain amount of money to the Secretary exclusively for research and development purposes. This "kitty" is for use at the discretion of the Secretary for any particular programs or projects that he feels need additional emphasis over and above the appropriated funds. There is no mandate that these funds be expended; rather the sum provided is a contingency or emergency fund to be used only if the need arises. The military departments may submit requests to the Department of Defense for all or part of these funds for certain specific projects, and if justification is strong enough, the funds requested may be transferred to the research and development appropriation of the Department concerned. The provision for this emergency fund for fiscal year 1956 was included in the appropriation bill as follows:

For transfer by the Secretary of Defense, with the approval of the Bureau of the Budget, to any appropriation for military functions under the Department of Defense available for research and development, to be merged with and to be available for the same purposes and for the same time period as the appropriation to which transferred, \$35,000,000 and in addition not to exceed \$50,000,000, to be used upon determination by the Secretary of Defense that such funds can be wisely, profitably, and practically used in the interest of national defense, and to be derived by transfer from such appropriations available to the Department of Defense, for obligation during the current fiscal year as the Secretary of Defense may designate.¹

¹Public Law 157-84th Congress Chapter 358, 1st Session
H.R. 6042.

In practice, these funds are normally used, based upon recommendations of the Assistant Secretary of Defense (Research and Development). It shall be noted that these funds are over and above the basic research and development appropriations of the Army, Navy, and Air Force.

Budget and expense accounting classifications for research and development appropriations.--The uniform budget and expense accounting classification of obligations and expenditures for research and development appropriations were prescribed by the Comptroller, Department of Defense, in January 1955. This classification is important from a fiscal standpoint because it provides for eight specific control points for the navy research and development appropriation. The entire navy research and development budget submission, as presented to the Congress, is cast in this format.

This classification system basically consists of the following divisions; each classification listed below is a budget activity under the major appropriation title:

- (a) Aircraft and Related Equipment
- (b) Guided Missiles and Related Equipment
- (c) Ships and Small Craft and Related Equipment
- (d) Combat and Support Vehicles and Related Equipment
- (e) Artillery and Other Weapons and Related Equipment
- (f) Ammunition and Related Equipment
- (g) Other Equipment
- (h) Military Sciences

Costs included in the Navy research and development appropriation.--The following costs are included in the Navy research and development appropriation:

- (a) Contractual services for design and feasibility studies
- (b) Contractual services for basic and applied research studies

- (c) Procurement of special items required for research and development functions.
- (d) Manufacture and fabrication of working and/or prototype models which are required to provide the basis for production in quantity for the testing, inventory, or service use.
- (e) Contractual services for development testing subsequent to production of service test but prior to production for inventory.
- (f) Other research and development costs.

Additionally, all of the costs listed above are distributed to government-owned facilities (or personnel) where the basic funding and accounting procedures exist or are developed to accomplish such a distribution.

The following costs are specifically excluded from the research and development appropriation: (a) material procured under procurement and procurement type appropriations for inventory (b) procurement of items in quantity for testing (such as guided missiles) prior to acceptance for inventory; this includes engineering, developmental, operational suitability and user tests.

CHAPTER II

FORMULATION OF THE NAVY RESEARCH AND DEVELOPMENT BUDGET

Programs and budgets.--In many phases of budget work, the term "program" and "budget" are used synonymously; this is true in naval research and development programs. Budgets formulated and submitted actually list those project items for which funds are programmed. In some cases large weapons systems may be listed as one lump project, the individual components being too numerous to list. Generally, however, the program or budget states the amount of funds required for each line item, and it is expected that the funds appropriated will be expended for the items as listed. The detailed control of funds spent on these projects is handled administratively by the agency sponsoring the project. This agency is also responsible for the submission of yearly progress reports on each and every one of these projects. Thus, when speaking of a Navy Bureau research and development program it can be directly associated with the Bureau's research and development budget since in effect the over-all summation of the budget items comprise the Bureau program. These programs, as formulated, reviewed, and approved become the working budget for the agencies concerned; these agencies in the Navy consist of the Navy Technical Bureaus, the Office of Naval Research, and the U.S. Marine Corps.

II. POLYIMIDE

[illegible]

Parallel lines followed from a programming and fiscal viewpoint.--In research and development budgets the planning and execution is reflected in two distinct areas. The first of these is from an operational standpoint. The second area concerns the integration of this operational or program total into the over-all fiscal picture of which the research and development budget is just one part. This latter step is accomplished within each agency by coordination between those personnel responsible for the preparation of the research and development budget and those responsible for the entire over-all fiscal estimates of the agency. Appendix I shows this relationship and also shows the general pattern of submission and review. The incorporation of the programs into the fiscal budget involves the recasting of the program budget into the uniform Department of Defense classification system outlined in Chapter I.

Thus, those personnel directly concerned with the administration of research and development programs do the necessary work of formulating these budgets; the programs are reviewed in detail on this basis. The fiscal divisions of the agency then incorporate the totals of these budgets in their over-all fiscal submissions.

Detailed steps of formulation.--Naval personnel engaged in worrying over research and development programs invariably deal with funds for three fiscal years. They are concerned with obligations for the previous year, the status of the program for the current year, and the planning and programming required for the next year. Because of the time required to plan and review any government budget, strict adherence to submission dates is mandatory. Formulation, review, and approval (including appropriation)

Generalized Linear Models and Logistic Regression

...is necessary and desirable to consider the situation and
attention is directed to the following points. The first of these
is that the generalized linear model is a model which is
intended to be used in situations where the response variable is
discrete. It is a generalization of the ordinary linear model in that
it allows for the possibility of non-normal distributions for the
response variable. It is also a generalization of the logistic model
in that it allows for the possibility of more than two categories
for the response variable. The model is written in the form
 $E(Y) = X\beta$ where Y is the response variable, X is the
design matrix, and β is the vector of parameters. The link
function $g(\cdot)$ connects the linear predictor $X\beta$ to the
mean of the response variable $E(Y)$. The link function is
assumed to be a monotonic function. The most common link
function is the logit link, which is used for binary response
variables. The logit link is defined by $g(\eta) = \frac{e^\eta}{1 + e^\eta}$,
where $\eta = X\beta$. The logit link is used because it maps the
linear predictor $X\beta$ to the range (0, 1), which is the range
of the probability of success. The logit link is also used
because it is a natural choice for the link function for binary
response variables. The logit link is also used because it is
a special case of the more general generalized linear model.
The generalized linear model is a very flexible model which
can be used to model a wide variety of discrete response
variables. It is a generalization of the ordinary linear model
in that it allows for non-normal distributions for the response
variable. It is also a generalization of the logistic model in
that it allows for more than two categories for the response
variable. The model is written in the form $E(Y) = X\beta$ where
 Y is the response variable, X is the design matrix, and β
is the vector of parameters. The link function $g(\cdot)$ connects
the linear predictor $X\beta$ to the mean of the response variable
 $E(Y)$. The link function is assumed to be a monotonic function.
The most common link function is the logit link, which is used
for binary response variables. The logit link is defined by
 $g(\eta) = \frac{e^\eta}{1 + e^\eta}$, where $\eta = X\beta$. The logit link is used
because it maps the linear predictor $X\beta$ to the range (0, 1),
which is the range of the probability of success. The logit link
is also used because it is a natural choice for the link function
for binary response variables. The logit link is also used
because it is a special case of the more general generalized linear
model. The generalized linear model is a very flexible model
which can be used to model a wide variety of discrete response
variables. It is a generalization of the ordinary linear model
in that it allows for non-normal distributions for the response
variable. It is also a generalization of the logistic model in
that it allows for more than two categories for the response
variable. The model is written in the form $E(Y) = X\beta$ where
 Y is the response variable, X is the design matrix, and β
is the vector of parameters. The link function $g(\cdot)$ connects
the linear predictor $X\beta$ to the mean of the response variable
 $E(Y)$. The link function is assumed to be a monotonic function.
The most common link function is the logit link, which is used
for binary response variables. The logit link is defined by
 $g(\eta) = \frac{e^\eta}{1 + e^\eta}$, where $\eta = X\beta$. The logit link is used
because it maps the linear predictor $X\beta$ to the range (0, 1),
which is the range of the probability of success. The logit link
is also used because it is a natural choice for the link function
for binary response variables. The logit link is also used
because it is a special case of the more general generalized linear
model.

therefore follow a definite chronology which in general patterns the over-all submission of the entire federal budget. In considering the Navy research and development budget as a whole, it is impossible to divorce the part played by the Assistant Secretary of Defense (Research and Development) from the navy budget itself since this Secretary acts as the coordinator for the Secretary of Defense for the research and development budgets of the three military series. Interwoven, therefore, with actions performed exclusively by the Navy in preparing its budget, are actions and requests by the office of this Secretary.

Initial policy guidance and assumptions.--About June of each year, the military Departments receive a letter from the Assistant Secretary of Defense (Research and Development) setting forth the policy, guidance, and assumptions to be used in preparing the research and development programs for the following fiscal year. This letter normally states policies and assumptions in general terms; the guidance may refer to over-all operational areas (Anti-submarine Warfare, Countermeasures, etc.) or it may specifically pin point emphasis on individual projects. Approximate money levels which each Department may reasonably expect the Congress will appropriate for the next fiscal year are also indicated. Over-all national policies as determined by the President and the National Security Council and any additional policy determined by the Secretary of Defense are outlined. Provisions is also made for submission of urgent requests over the generally established level. This guidance is the first working tool the Navy has in planning its next years program.

Factors involved in establishing initial levels.--The

President and the Secretary of Defense have specific motivation for their initial guidance; within the Navy the basis for tentative fund allocation is determined after consideration of several factors. The primary consideration of course is operational readiness. In this respect it should be pointed out that each research and development project prosecuted under navy programs has to directly support a written operational requirement promulgated by the Chief of Naval Operations. These requirements are specific as to what equipment is required, and responsibility for prosecution of the development of equipment and/or coordination with other agencies is assigned to one technical Bureau or office. Thus in determining tentative allocations, those agencies which could be expected to do the lion's share of the research and development (based on the operational requirements) can normally expect to receive the lion's share of the funds.

Individual bureaus also consider in their programming such general things as industrial mobilization and the effective use of the research and development facilities and scientific manpower under their technical management.

Action required by naval bureaus.--Initial guidance to the Navy Department is normally forwarded to the Secretary of the Navy who in turn forwards it for appropriate action to the Chief of Naval Research. The latter, after review for technical feasibility and for operational suitability (done by Chief of Naval Operations) requests the necessary program submissions from the Bureaus and the Marine Corps. This request states the tentative Navy allocations,

makes provision for a program submission slightly above the allocation figures, and generally also provides for contingency of program submissions on a lesser basis. This over and under submission is usually in an amount of ten percent.

Chronology --Budget submissions follow a general chronology as indicated below:

June - Guidance received for fiscal year beginning 13 months hence.

July - August. -Naval agencies make submissions.

September - October. -Review of program by naval review bodies.

November - December. -Review of program by Assistant Secretary of Defense (Research and Development) and approval by Secretary of Defense.

December - . -Review by Bureau of the Budget.

March - June. - Hearings before House of Representatives and Senate.

July - August. -Funds appropriated by Congress.

Format of submissions.--The Chief of Naval Operations and the Chief of Naval Research specify the format of the submissions. This format stems from the Navy Research and Development Planning System and is designed to provide the greatest possible assistance to those agencies within the Navy which review the program as well as the staff of the Assistant Secretary of Defense (Research and Development) which subsequently reviews the programs through use of its coordinating committees. For any project listed in a program submission it is classified (a) according to over-all operational field (called a Planning Objective or Category, such as Air Defense) (b) by operational requirement within this category

(c) by operational priority as established by the planning system and (d) by one of uniform classification numbers of the uniform classification system. For comparative purposes, the funds obligated for the same project (or line item) for the previous fiscal year are also included. This submission is the actual working program of an agency based on operational requirements. If required, this program may be accompanied by a summary of the projects under the uniform classification system. The review is conducted on the program submitted based on operational requirements.

CHAPTER III

REVIEW OF THE RESEARCH AND DEVELOPMENT BUDGET

This chapter traces the review processes of the Navy research and development programs. Review is performed by (a) Chief of Naval Research, (b) Navy Research and Development Review Board, (c) Navy Research and Development Committee, and (d) The Office of the Assistant Secretary of Defense (Research and Development). The functions and authority of each of these review agencies is briefly covered in the following paragraphs.

Recent Reorganization Changes in Navy Research and Development.--The Report of the Committee on Organization of the Department of the Navy (established by the Secretary of the Navy in October, 1953) recommended that certain internal advisory committees made up of key executives of the Navy Department be established to deal with certain specific categories. Each committee would consider matters within its functional purview for the purpose of improving coordination among all activities of the Department working in the committee's field, each committee being advisory and possessing no executive authority. The Navy Research and Development Committee was one such committee recommended in the aforementioned report; this committee was established by the secretary of the Navy in the latter part of 1954.

Additionally the report recommended that the Chief of Naval Research be given the responsibility for coordinating and passing on the technical feasibility of Navy research, and development

programs. This recommendation was also carried out and the Chief of Naval Research was given these responsibilities and also made the Comptroller of Research and Development for the Navy.

Chief of Naval Research.--The Chief of Naval Research acts as the Navy Coordinator and spokesman for all matters involving research and development. The statement of Admiral Firth, Chief of Naval Research, while appearing before the 84th Congress in justification of naval estimates sums up the responsibilities of this position.

All funds for the Navy's research and development program are now combined in a single appropriation titled 'Research and Development, Navy.' My office has been assigned responsibility for the administration of this appropriation, including preparation of the budget and maintenance of the necessary control records. This change in appropriation structure has not taken away the responsibilities of the individual Bureaus and the Marine Corps for the preparation and execution of their assigned portions of the research and development program. They will continue to prepare the basic budget estimates and perform the detailed accounting therefor.

Basically this office checks initial submissions for mathematical accuracy, format and adherence to previously determined (and promulgated) policy. All estimates are submitted to this office, and prior to consolidation into an over-all program any discrepancies discovered are immediately brought to the attention of the submitting agency prior to any further review. Additional review procedures are currently being formulated by this office and its staff is being expanded to better accomplish its assigned responsibilities.¹

Navy Research and Development Review Board.--This review board reviews the over-all program submissions for the Chief of Naval Operations. It is composed of the directors of the various warfare divisions of the office of the Chief of Naval Operations

¹Hearings before the Sub-Committee of the Committee on Appropriations House of Representatives, 84th Congress.

and as such the review is conducted primarily from a standpoint of how the program will increase fleet operational readiness. The program is also reviewed from a standpoint of priorities, and projects are checked to see that those that have been assigned high priorities are receiving proper emphasis.

Navy Research and Development Committee.--As previously mentioned, this committee is an internal navy committee acting in an advisory capacity and it is responsible to the Assistant Secretary of the Navy for Air. It has no executive authority of its own. This committee is composed of the following personnel:

Assistant Secretary of the Navy for Air, Chairman

Deputy Chief of Naval Operations (Fleet Operations and Readiness)

Deputy Chief of Naval Operations (Air)

Assistant Chief of Staff (G-4), USMC

Chief of Naval Research, and

Assistant Chiefs for Research and Development for the following Bureaus: Aeronautics, Ordnance, Ships, Yards and Docks, Medicine and Surgery, Supplies and Accounts, and Personnel.

This committee submits for the approval of the Assistant Secretary of the Navy for Air a technical research and development program in support of Navy and Marine Corps operational requirements. This program is the consolidation of the individual Bureau programs. The committee also reviews the allocation of funds to the projects made by the Bureaus, the Office of Naval Research, and the Marine Corps and submits the recommended consolidated budget each fiscal year for approval of the Assistant Secretary of the Navy for Air.

and as such the review is conducted primarily from a technical point of view. The program will however, have operational implications. The program is also reviewed from a standpoint of efficiency and economy and the results are reported to the Navy and the Army. The program is also reviewed from a standpoint of efficiency and economy and the results are reported to the Navy and the Army.

Navy Research and Development Committee -- The primary function of this committee is to coordinate and supervise the research and development activities of the Navy. It is composed of representatives of the various departments of the Navy and the Army. The committee is also responsible for the coordination and supervision of the research and development activities of the Navy and the Army. The committee is also responsible for the coordination and supervision of the research and development activities of the Navy and the Army.

Chief of Naval Operations (CNO) -- The Chief of Naval Operations is the highest-ranking officer in the Navy. He is responsible for the overall command and control of the Navy. He is also responsible for the coordination and supervision of the research and development activities of the Navy. The Chief of Naval Operations is also responsible for the coordination and supervision of the research and development activities of the Navy.

Assistant Chief of Naval Operations (ACNO) -- The Assistant Chief of Naval Operations is the second-highest-ranking officer in the Navy. He is responsible for the overall command and control of the Navy. He is also responsible for the coordination and supervision of the research and development activities of the Navy. The Assistant Chief of Naval Operations is also responsible for the coordination and supervision of the research and development activities of the Navy.

It is noteworthy that both the producer and the user (i.e. the Bureaus and the Chief of Naval Operations) have membership on this committee. The review is primarily made to determine if the programs submitted prosecute outstanding operational requirements and follow established guidelines. During the review it is quite possible for projects to be deleted from the program or for funds to be increased or decreased for any particular project. Every effort is made by this group to see that (a) urgent projects receive enough emphasis (b) a proper balance is maintained so that projects of immediate lesser importance but of potential long range value are not neglected.

Office of the Assistant Secretary of Defense (Research and Development).--Under Reorganization Plan No. 6 of 1953 the position of this Assistant Secretary was established. Basically his charter includes those functions and responsibilities which were formerly performed by the chairman of the Research and Development Board. This Board grew to such large physical proportions that its efficiency was impaired and the present streamlined office of this Assistant Secretary was established with a view to obtaining research and development coordination within the office without the large staff formerly required. The charter for this position provides in part for the following functions.

- (a) Providing advice and assistance to the Secretary of Defense and his staff on research and development aspects of the Department of Defense policies, plans, and programs.

(b) Developing policies and establishing procedures for effecting a sound and integrated research and development program in the Defense Department; for assuring that the nation's best scientific and technical talents are applied to planning and prosecution of military research and development programs; and for assigning specific responsibilities to the various military departments for research and development programs in cases where it appears that unnecessary duplication will be eliminated, efficiency promoted or economy achieved by such action.

(c) Reviewing the proposed research and development budgets and planned obligations including proposals for allocations from the research and development Emergency Fund of the Departments and joint agencies (such as Armed Forces Security Agency) and making recommendations to the Secretary of Defense for action.

This office also formulates criteria for release of Emergency Funds for research and development purposes and establishes requirements for budget and obligation information for these programs. Thus, the primary responsibility of this office is the over-all coordination and integration of the three military research and development programs within the Department of Defense. The responsibilities with respect to review of the budget and planned obligations, along with the function of collaboration with the Defense Department Comptroller merit particular attention as

these responsibilities play a direct part in the review of the naval research and development program both from an operational programming and fiscal viewpoint.

The final review of the Navy program is made by this office and program changes which are considered necessary are made. This review is accomplished through the use of individual coordinating committees and working groups on which each Department has representation. In the final review of the Navy program in the office of the Comptroller, Department of Defense, representatives of the Bureau of the Budget also sit in on the hearings. Here the program is viewed from a fiscal standpoint and from the format of the uniform classification system. Any suggestions or arguments from this Bureau's viewpoint are thus usually resolved before the program is officially reviewed by the Bureau of the Budget.

CHAPTER IV

CONTROL OF THE NAVY RESEARCH AND DEVELOPMENT BUDGET

After the Congress has appropriated funds for the Navy Budget (including the research and development appropriation) the naval research and development agencies are free to commence obligation of their approved programs. Various administrative controls and checks have been established to watch-dog these programs. In any discussion of these controls it is significant that, to a great extent, these controls are beneficial to the operating agencies in that through a schedule of planned obligations and apportionment, obligations must be programmed in a manner to insure a continuous flow of obligations and commitments throughout the fiscal year, thus preventing a last minute peak build-up at the close of the fiscal year (which in the past has been sometimes interpreted to mean a last ditch effort to obligate money rather than have it revert to the Treasury).

Control for naval research and development is exercised at the following levels: (a) by the Comptroller, Department of Defense (through the office of the Assistant Secretary of Defense for Research and Development) (b) by the Navy Comptroller for Research and Development, and (c) internally by the operating agency concerned. The aspects of this control is discussed in the following paragraphs.

Comptroller, Department of Defense.--During the first or second month of the fiscal year, the Comptroller of the Defense Department forwards to the Secretary of the Navy a list of the planned obligations for the Navy bureau concerned. This list includes specific dollar amounts that may be obligated for each research and development classification (outlined in Chapter I). Since there are numerous projects within any one classification the Bureau concerned has the right (within reason) to shift funds between projects in the classification as long as the classification total remains unchanged. This provides for flexibility within the given classification (usually required by administrative or minor program changes) without changing the over-all emphasis given to this field. Any change desired by a naval agency which entails a major shift of funds from one classification to another requires special justification and approval through the same chain of command which originally reviewed the program.

The Assistant Secretary of Defense (Research and Development) maintains a continuous watch over the programs. If any program or project is reconsidered, or there arises some doubt as to its technical or operational feasibility, the Secretary may administratively withhold funds pending a review and a decision. If this occurs after approval of the program, and after funds have been appropriated, the program is merely suspended pending additional review of its status. Funds are withheld by the Apportionment process; the Assistant Secretary of Defense for Research and Development merely makes recommendations to the Bureau of the

Constitutional, Legislative and Judicial

second month of the fiscal year, the Commission on the National
 Governmental Commission to the Secretary of the Navy a list of the
 planned activities for the next quarter. This list in-
 cludes specific dates when the work will be completed. The work on
 various and development activities (outlined in Exhibit I).
 Since there are numerous projects which are classified
 the National Government has been able to obtain a more complete
 picture of the classification of the projects as well as the classifica-
 tion of the projects themselves. This provides for classification after
 in the classification (which) required by administrative
 or other purposes (classification) and the general purpose
 also to the list. Any change in the classification of the
 projects is made after a review of the classification is made
 requires special investigation and approval of the National
 Government when necessary to review the projects.
 The National Government of the National Government has been
 able to obtain a complete view of the projects. It has
 been able to obtain a complete view of the projects and the
 projects are classified in the National Government. The National
 Government has been able to obtain a complete view of the
 projects and the projects are classified in the National
 Government. The National Government has been able to obtain a
 complete view of the projects and the projects are classified
 in the National Government. The National Government has been
 able to obtain a complete view of the projects and the projects
 are classified in the National Government. The National Govern-
 ment has been able to obtain a complete view of the projects
 and the projects are classified in the National Government.

Budget, and the latter, by correspondence to the Secretary of the Navy informs him of a revised apportionment schedule. This apportionment process is the most important means of control.

Navy Comptroller for research and development.--The Chief of Naval Research, acting in his capacity as the Research and Development Comptroller, and working closely with the office of the Navy Comptroller, also maintains a continuous check on the naval programs. Any requests for fiscal information pertaining to these programs are answered by this office. Changes in schedules of obligations are also forwarded via this office to the Bureau concerned. If these changes involve coordination between more than one Bureau it is accomplished through this Comptroller.

Internal control by Bureaus.--Financial control and management of a Bureau's research and development program varies with the agency. Generally, however, this is accomplished by internal controls established by the agency and geared to individual needs. For example, within the Bureau of Aeronautics, as contracts and amendments are processed from the research and development divisions they are entered against individual program cards which indicate the total allowable obligation for the fiscal year. This function is performed in a staff division which administratively clears the requests of the operating division. These cards serve as a control check against over-obligation and the file is maintained exclusively for this purpose. Individual operating divisions and project officers also maintain their own records for each project.

Control reports.--An annual report of actual obligations incurred is required of each naval agency for its research and development program. This report is submitted to the Navy Research and Development Controller in August, and it contains the actual obligations incurred, by projects, for the previous fiscal year as of a cut-off date of 30 June. Thus to some extent it is not a completely accurate picture since normally some few additional obligations may not be included. Generally, however, it gives a true picture of the funds obligated by an agency. This report is submitted to the Navy Comptroller for Research and Development and after the latter has reviewed and compiled them for all the Bureaus involved in research and development, the consolidation is forwarded to the Assistant Secretary of Defense for Research and Development.

An additional control report is also submitted, pertaining more to an administrative control, but one which nonetheless involves some fiscal aspects. This report requires the agency to list major accomplishments during the previous fiscal year and those projects terminated or suspended because of lack of promise or funds, or because of discovered duplication.

General Remarks.--The annual report of the

interest is reported at various points for the various and de-
velopment system. This report is submitted on the basis of the
and Development Committee to suggest, and to consider the various
advisory committee, by resolution, for the various items year
at a rate of 20 per cent. The report is in the form of a
committee advisory report and is submitted to the committee
development may not be included. Generally, however, it gives a
true picture of the facts and figures of the country. This report is
submitted to the Development Committee for review and approval and
after the facts are reviewed and approved then for all the business
involved in the report and development, the committee is to-
gether to the committee of the Development Committee and the
development.

In addition, a committee report is also submitted, containing
more or less administrative matters, and are also submitted to
the Development Committee. This report contains the report to
the Development Committee during the previous fiscal year and
from the committee of the Development Committee at the end of the
on the basis of the Development Committee.

CHAPTER V

PROBLEMS INVOLVED IN RESEARCH AND DEVELOPMENT AND A SUMMARY OF NAVY PROCEDURES

A sound research and development program involves questions of national security, the use of scientific manpower and facilities, and the economical use of the nation's resources.

The problem of budgeting for research and development could easily be dismissed as insoluble were it not for the fact that decisions on the subject are rare and have to be made. In the nature of the case the fruits of research can neither be foreseen nor dispensed with. Although there is no rational way to determine the size of a research program ab initio, judgements can be made on whether a program should be increased or decreased. As noted above, a relative diminution of percent as compared with remote danger should result in a shift in available resources from current defense to research. The progress of current research furnishes the new fields that must be explored if we are to keep up with potential antagonists. While such considerations provide the environment in which research programs should be considered, the program itself must be built up on a specific project basis; and the judgements must be made concerning the relevance and importance of individual projects in the course of the budget process. ...

Development involves difficult decisions similar to those required for the research program. Research is "cheap" in relation to the cost of a bomber. Without great cost, the Government can throw its research net wide. If projects turn out to be misdirected or prove to be failures, not much is lost. Development is also cheap in relation to the cost of future procurement programs. To spend relatively modest amounts on the development of a variety of weapons, some of which will never be used, may save billions in future years. Development decisions must be taken when the future to which they relate cannot clearly be foreseen.¹

¹Arthur Smithies, The Budgetary Process in the United States, p. 275

Summary of Navy Research and Development Procedures

First, the Office of the Assistant Secretary of Defense for Research and Development provides broad guidelines to be used in planning the Navy's research and development program. The Chief of Naval Operations and the Chief of Naval Research review the current program in the light of these guidelines and prepare their recommendations. The Chief of Naval Operations is concerned with how well the program meets military requirements; the Chief of Naval Research is concerned with technical adequacy and feasibility. Their recommendations are reviewed by the Navy Research and Development Committee which makes recommendations for detailed guidelines. The Assistant Secretary of the Navy for Air then approves these and they become the basis for the Navy's program planning.

The second stage involves the preparation of a proposed program by the individual program managers to fulfill their responsibilities and to conform to the guidelines assigned. Proposed programs are assembled and reviewed by the Chief of Naval Operations and the Chief of Naval Research; the results are then reviewed by the Navy Research and Development Committee and approved by the Assistant Secretary of the Navy for Air. The program is then forwarded to the Assistant Secretary of Defense for Research and Development where, together with the programs of the other two services, it is reviewed by the coordinating committees. After approval by the Department of Defense and review by the Bureau of the Budget, it is justified before the Congress. Fiscal control of the program is accomplished through apportionment and

at levels including both the Department of Defense and the Department of the Navy.

APPENDIX I

RELATIONSHIP BETWEEN PLANNING, PROGRAMMING AND FISCAL ELEMENTS

<u>Policy and Plans</u>	<u>Programs</u>	<u>Fiscal and Budget</u>
PRESIDENTIAL LEVEL		
National Security Council		Bureau of Budget
SECRETARY OF DEFENSE LEVEL		
Joint Chiefs of Staff	Asst. Sec. Def. (R & D)	Sec. Def. Controller
SECRETARY OF NAVY LEVEL		
Chief of Naval Operations (OPNAV, Budgetary Advisory Group)	Navy Research and Development Review Board, <i>Comptroller</i>	Navy Comptroller
CHIEF OF BUREAU LEVEL		
Planning Division	Research and Development Divisions	Bureau Comptroller

APPENDIX I

RELATIONSHIP BETWEEN PLANNING, PROGRAMMING AND FINANCIAL MANAGEMENT

<u>Planning and Finance</u>	<u>Programs</u>	<u>Planning and Finance</u>
Bureau of Finance	CONSTITUTIONAL LEVEL	National Security Council
Joint Chiefs of Staff	CONSTITUTIONAL LEVEL	Joint Chiefs of Staff
Navy Department	CONSTITUTIONAL LEVEL	Office of Naval Operations - Navy Department Development Division (Navy Bureau)
Navy Department	CONSTITUTIONAL LEVEL	Planning Division

BIBLIOGRAPHY

- Bureau of the Budget, Special Analysis H, Research and Development, January 1955.
- Department of Defense Instruction No. 5100.3 of 27 October 1954.
- Department of Defense Instruction No. 5128.7 of 12 November 1953.
- Department of Defense Instruction No. 7220.5 of 5 January 1955.
- Naval Comptroller Instruction 7000.9 of 18 June 1955.
- Naval Comptroller Notice 7110 of 22 June 1955.
- Chief of Naval Operations Instruction 3910.1.
- Chief of Naval Operations Instruction 3900.5
- Federal Funds for Science (NSF), 1953, 1954, 1955.
- Federal Research and Development Budget (NSF) 1954, 1955, 1956.
- Secretary of the Navy Instruction 5430.2.
- Secretary of the Navy Instruction 5420.30A.

